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ABSTRACT

Seychelles Integrated Science (SIS), a 3-year laboratory-based science program for students (ages 11-15) in upper primary grades 7, 8, and 9, was developed from an extensive evaluation and modification of previous P7-P9 materials. This P7 SIS unit focuses on: (1) the importance of air and air pressure in students' everyday lives; (2) oxidation concepts involved in burning and breathing; (3) developing laboratory skills, particularly those related to taking and recording measurements of the weather; and (4) how knowledge of air can be used in everyday situations, such as in fire prevention. Provided for the unit is a student workbook and a set of teaching notes. The teaching notes include the general aims of the unit and a lesson plan for each topic area. Each lesson plan includes a suggested time frame, a list of objectives, a list of equipment needed, and a suggested lesson format. This format includes suggestions for introducing the lesson, instructional strategies (emphasizing procedures for student activities), and evaluation methods. The student workbook includes procedures for completing the unit activities and a list of new words keyed to page numbers in the workbook. (JN)

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seychelles integrated science

Unit 2

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TEACHING NOTES

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The Goals of Unit 2

In Unit 1 we familiarized the pupils with working in a laboratory and introduced them to some of the basic laboratory techniques we use in science, particularly the physical techniques involved in measurement.

In this, the second unit of the SIS Programme, we introduce the pupils to some concepts about air - one of the most common substances in our environment. Throughout the unit we relate knowledge and ideas about air to its effects and uses in everyday life.

Overall the Unit has Four goals;

(1) To make the pupils aware of the important role air and air pressure play in our everyday lives.

(2) To develop in the pupils an elementary understanding of the oxidation concepts involved in burning and breathing.

(3) To further develop in the pupils some basic laboratory skills particularly those related to the taking and recording of measurements of the weather.

(4) To foster in the pupils an awareness of how they can use their knowledge about air in their everyday lives, for example, in the prevention of fire.

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Lesson

Unit 2 Topic 1

Air is There

Time

We suggest that Topic 1 should take about six periods.

Objectives

At the end of the Topic the pupils should;

(1) be able to recall three examples which illustrate the presence of air in everyday life, e.g. movement of trees, flags and smoke,

(2) know that there is air inside 'empty' objects such as beakers, bottles and shells and be able to demonstrate its presence in these objects,

(3) be able to explain in their own words that water contains air and that fish breathe this air,

(4) be able to design, plan and carry out an experiment in the laboratory to find out whether or not people can taste a difference between tea made with freshly boiled water and tea made with water which has been boiled earlier and then reheated.

Equipment

Each group of pupils will need,

- a plastic bag (1.1)
- a beaker, some dry paper and use of a sink or basin (1.2)
- a narrow necked bottle, a filter funnel and some plasticene (1.3)
- an empty shell, a coconut husk, some soil and a piece of sponge and coral (1.4).

For activity 1.7 you will need to borrow a kettle and or teapot and have some tea or teabags. (You may also wish to have some milk). Remember to boil and cool some water before the lesson starts.

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Suggested Lesson Format

Introduction	We suggest you start the lesson by taking two sheets of paper , crumple one and leave the other uncrumpled. Drop both sheets from the same height and then ask the pupils to explain what happened and why it happened.
Activities	Let the pupils work in groups of three or four. Get them to look at the pictures on page 1 and to decide in their group how each picture tells us that there is air all around. Let one person from each group report on their suggestions. Get one person from each group to fold and 'flatten' the plastic bag. Then ask the pupils to explain why they cannot flatten it completely (Objective 1). Ask the pupils to read section 1.2 and 1.3 and then to try out both activities. Allow them a few minutes to discuss their results within the group and then ask one person from each group to report on what happened and why the group think it happened. With Activity 1.3 let the pupils break the plasticene seal around the bottle and then explain to you what happens. Hold up a shell and ask the pupils is it 'full' or 'empty'. Ask the pupils to drop their shells into the water and to observe what happens. Ask them what was the shell 'full' of (Objective 2). Let the pupils look at the fish in an aquarium or in a nearby stream. Tell them that fish need air to stay alive and then ask them to suggest where the fish gets it's air from. Let them watch a fish to see that it doesn't rise to the surface to breathe. Ask the pupils if they could breathe the air inside water.

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After the discussion tell the pupils that in their next activity they are going to try to find the air in water - the air that fish breathe. Let them then read and carry out Activity 1.6 (Objective 3).

Ask one or two pupils to describe how to make a pot of tea. From their descriptions question them about whether the water needs to be freshly boiled or not. Let as many of the class as possible discuss whether or not they use freshly boiled water at home. Ask the pupils if they can tell the difference between tea made with freshly boiled water and that made with re-boiled water. Ask them "How could we find out for sure ?" In groups let the pupils design an experiment to find this out. Discuss their design and then let one group demonstrate to the rest of the class. For example, using some freshly boiled water and some re-boiled water, they could make two large beakers of tea (using equal numbers of tea bags). They could then pour out six small beakers or cups of tea - three of each type. After labelling and mixing up the beakers one group of pupils can then test a second group to see how well they can identify the two types of tea. (Preferably the 'test' group should be kept in the prep room with the technician while the tea is being set out. Get one or two pupils to set out the results of the experiment on the board and let the other pupils copy these.

Afterwards get the pupils to describe in their own words what they did and what happened. Use their words to build up a summary - or list of key words - on the board and then let the pupils write into their books what they did and what happened.

Discussion and Evaluation

This is quite a long Topic, so you shouldn't leave all the discussion and evaluation until the end. After each activity allow the pupils some time to discuss their results and their understanding and at the end of each

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lesson check that the pupils have achieved the lesson objectivesCheck their notes and finally when you have completed the Topic revise it and check that the pupils have achieved the four objectives.

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Lesson

Unit 2 Topic 2

The Pressure of Air

Time About six periods

Objectives At the end of the Topic the pupils should be able to;

(1) recall two examples of the effect of air pressure in our everyday lives,

(2) explain in their own words how we can use a large screw top tin to demonstrate the 'strength' of air pressure,

(3) explain in their own words why we can not pour liquids out from a can which has only one small hole in it,

(4) make a model drinking fountain using a basin, a jar and some plasticene, and

(5) make a carteasan diver using a gas-jar or bottle, a teat dropper and water.

Equipment You will need;

- an empty plastic squash bottle or juice carton,
- a vacuum pump, base plate, bell jar and balloon (2.3)
- a large (about 3 to 4 litre) can and tripod and burner (2.4)
- a tin of milk or juice
- a large bottle with a narrow neck (2.5)

Each group of pupils will need

- a plastic bag and a book
- a small plastic bowl (e.g. from a lever arm balance), a small jar or bottle and a teat dropper.

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Suggested Lesson Format

Introduction — Using an empty plastic squash bottle or juice carton suck some of the air out of it until the sides of the bottle (or carton) are squeezed in. Ask the pupils if they can explain what has happened - Why are the sides squeezed in ? What squeezed them in ?

Activity — Let the pupils read and then carry out Activity2.1. Encourage them to get the idea that something must be pushing in the bottle and the bag, that the air around the bottle is pushing on it. Ask the pupils what would happen if they 'took away' the air outside the bottle (Objective 1). Explain that the vacuum pump can do this and then demonstrate Activity 2.3. Allow the pupils a few minutes to discuss in groups what they observed and to suggests reasons for their observations. Let one person from each group report on the group's suggestions. Introduce the term 'air pressure' to explain the idea of the air that is all around us pressing on the balloon and the squash bottle. Tell the pupils that in the next activity they are going to see the strength of air pressure.

For Activity 2.4 you will need to explain how the water vapour coming from the boiling water in the can will push out all the air in the can and when you screw on the lid no air will be able to get back into the tin. The water vapour will cool back down into a liquid again and so leave an empty space in the tin where there is no longer any air. Carry out the demonstration. (Sometimesyou may have to speed up the cooling of the can by pouring some cold water over it).

Let each group of pupils prepare a written note on what happened and why they think it happened . You and the technician should move from group to group checking this work and then allowing each pupil time to write up

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their report (Objective 2).

Open a tin of juice or evaporated milk by making one small hole in the tin. Ask some of the pupils to pour out the juice or milk into a beaker. The ask why the liquid will not pour - and what should we do to get it to pour. In the discussion bring out the idea that the liquid can only come out if air can get in to replace it. Fill up the large narrow necked bottle with water, turn it upside down over a sink and show the pupils the bubbles of air going into the bottle as the water pours out (Objective 1).

Let the pupils read and then carry out Activity 2.6. Allow them a few minutes to discuss why the water dosn't pour out. Discuss their ideas and draw a diagram on the board to illustrate the idea that it is the air pressure on the water in the bowl which 'holds up' the water in the jar. (If you have a length of glass tubing you can seal one end and show the pupils how 'far up' the air pressure can push the water). (Objective 4)

Let the pupils read and try Activity 2.8 -over a sink ! Again let them suggest the reasons for what happens and draw a diagram on the board to illustrate the air pressing up against the card.

Let the pupils read and then try out Activity 2.9. You and the technician should move around helping the different groups. It will take a little care in adjusting the amount of liquid in the teat dropper to get it to rise and fall. Get the pupils to watch the level of the water in the dropper and then to try to explain what happens. All that is required at this stage is a very simple explanation that as they change the air pressure with their hand they also change the amount of liquid in the dropper and so make it sink or float (Objective 5).

Discussion and Evaluation

Check the pupils' written work and diagrams. As you do so ask them to explain to you what is 'happening' in each diagram.

Lesson

Unit 2 Topic 3

Using the Air Around Us

Time About six periods

Objectives At the end of the Topic the pupils should ;

(1) be able to recall three examples of how man uses air in everyday life, e.g. breathing, sailing, flying, providing energy and drying clothes,

(2) be able to explain in their own words that the- air of the - wind can be used to turn a windmill and the windmill can be used to do jobs such as pumping water,

(3) know that aeroplanes and helicopters depend on air to enable them to fly,

(4) be able to plan and carry out an experiment to find which of four paper 'helicopters' falls through the air most slowly, and

(5) be able to use a bottle and a length of rubber tubing to siphon water from a sink into the bottle.

Equipment Each group of pupils will need

- a piece of card about 10cm by 10 cm
- use of scissors and a ruler
- a pin or nail and a piece of stick (or paper roll) (3.1).
- a sheet of A4 paper (3.3)
- four small rectangles of cardboard 10cm by 5cm
- four paper clips
- use of scissors and ruler (3.6)
- a bottle and about 1m of rubber tubing.

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If possible you should have a fan available in the classroom.

Suggested Lesson Format

Introduction

Ask the pupils if anyone can think of a way that we use air. Allow one or two pupils to answer and then allow everyone five minutes or so to think of as many uses of air as they can. Let the pupils read out their suggestions and keep a record of a variety of uses on the board (Objective 1).

Activity

Let the pupils read section 3.1 and then make the windmill. You and the technician should help as needed. If you have a fan switch it on so that the pupils can test their windmills Ask the pupils if they can think of any use for their windmills. Some of them may have heard from stories about windmills being used to grind wheat or corn - you should also describe how a windmill is used to pump water on the island of Poivre.
Ask the pupils to prepare a sentance or two that they could write about windmills. Discuss their ideas and choose a sentance or sentances made up by them. Write this on the board and let the pupils copy it into their books.

Let the pupils carry out Activity 3.3. You and the technician should check to see how well they can follow the instructions. Let the pupils try out their planes. If you have a fan tilt it upwards and let the children see how this affects their planes. Discuss the idea that the aeroplane is floating on the air and that without air it could not fly (Objective 3).

Allow the pupils some time to think about and discuss what life would be like in Seychelles if there were no aeroplanes (section 3.4).

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Let the pupils copy the table in section 3.5 into their books . Let them complete it individually and then discuss their ideas with their group. Allow one person from each group to report on the differences they have noted.

Get the pupils to read section 3.6. Allow the groups some time to plan their experiment and then to report and discuss with you, what they will do and how they will record their results. When you are satisfied let each group begin. Finally allow each group to report to the class on what they did and what results they got. Write some key words about the experiments on the board and then get each pupil to draw a diagram of the helicopters and to write up their own reports and results using the key words on the board (Objective 4).

For each group fill a sink (or basin) with water, place the bottle on the ground beneath the sink and then ask the pupils to fill the bottle with water using the rubber tubing. Allow the pupils some time to experiment for themselves. After a while if they don't manage to set up a siphon demonstrate how to do this by placing one end of the tube in the sink and sucking the other end until the water starts to come through - then set this end of the tube into the bottle (Objective 5).
Let the pupils find ways of stopping the siphon and then let them discuss how (and when) we could use a siphon.

Discussion and Evaluation

Much of the discussion should take place at the start and end of the individual activities. At the end of the whole Topic give a brief summary of what has been done in the Topic and then check the pupils achievement of objectives 1,2,3 and 5.

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Lesson

Unit 2 Topic 4

Burning in Air

Time About four periods

Objectives At the end of the Topic the pupils should;

(1) know that some substances will catch fire more easily then others,

(2) given a list of the four substances,paper,sawdust, sugar and coconut, be able to identify which will catch fire most easily,

(3) know that for a substance to keep burning it must have air and that if air is prevented from reaching a fire then the fire will go out,

(4) be able to explain in their own words that,
(a) naked flames should never be used near substances which catch fire easily, i.e. inflammable materials such as petrol and kerosene,
(b) inflammable materials should be stored safely away from heat,

(5) be able to extinguish a small fire at home or in school using wet sand, water or damp cloth.

Equipment You will need an evaporating basin with some alcolol in it.

Each group of pupils will need

- tin lid,tripod stand and gas burner
- small samples of paper,sawdust,sugar and coconut (4.1)
- a gas jar and two candles (4.4)
- waste paper, a little kerosene (about 15 ml) and a tin lid. Some wet sand and damp cloth (4.5)

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Suggested Lesson Format

Introduction

Show the pupils the evaporating basin with about 10 ml of alcolol in it. Light it with a match - to show how easily it catches fire. Put out the flame with a book or asbsestos mat, then try to light the alcohol again by bringing the match close to but not touching the alcohol. Tilt the basin so that the pupils can see. Finally try heating the basin on a tripod stand until the alcohol catches fire by 'itself'. (To extinguish it turn off the gas and cover the basin with a book or asbestos mat).

Ask the pupils if they can name any other materials which catch fire easily.

Activity

Let the pupils read section 4.1 and then carry out the activity in groups of four or five. Allow the groups a few minutes to record their results and to prepare a report on what they did. Let one person from each group report and use these reports to write an outline on the board. Let each pupils then write up the activity using your outline as a guide (Objectives 1 and 2).

Let the pupils read 4.3 and 4.4 and get each group to discuss their plan with you or the technician. Let them carry out the activity and prepare a sentance or statement about what they have learned. Let each group report on their statement (Objective 3).

Let the pupils read section 4.5. Take care that they have all understood the instruction. It might be safer to organize this activity so that only four groups carry it out at one time and the others wait until the first groups have completed it.

Discussion and Evaluation

We suggest that you write three or four questions on the board and allow each group some time to discuss and prepare answers to them. Questions such as;

(1) Why should we not keep an open bottle of alcohol near a burner ?

(2) At home where would be the best place to store a can of kerosene ?

(3) If a pot with hot oil in it went on fire in the kitchen how could we best put it out?

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Lesson

Unit 2 Topic 5

Some Gases in the Air

Time Four to five periods

Objectives At the end of the Topic the pupils should;

(1) know that air contains the gas oxygen,

(2) be able to explain in their own words how to prepare oxygen by heating potassium permanganate,

(3) be able to explain in their own words that when a substance with carbon in it burns it uses up some of the oxygen in the air and makes a gas called carbon dioxide,

(4) know that carbon dioxide turns limeater milky,

(5) be able to use a tin can , gas burner and some saw dust (or matchsticks) to make a limited supply of air,

(6) know that charcoal is made by burning wood in a limited supply of air

Equipment You will need an electric fan (if possible) and some lumps of charcoal.

Each group of pupils will need

- a test-tube and splint and about a spatula full of potassium permanganate (5.3)
  (Keep a few spare tubes of permanganate ready and allow pupils to repeat the activity if they 'miss' the oxygen at first).
- two gas-jars with lids, a splint and about 10 ml of lime water in each jar
- a small tin can with a lid and enough sawdust,

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or used matchsticks to half fill the tin. The larger the tin the longer this activity will take. Allow about thirty minutes if you use a small coffee tin.

Suggested Lesson Format

Introduction

Switch on the electric fan (or get the pupils to fan themselves with a book) so that everyone can 'feel' the air. Ask the pupils if they can smell air. Bring out the idea that they can feel air but cannot see or smell it. Then ask the pupils if they can tell you what air is. Allow them a few minutes to discuss the question with their partner. From the discussion lead on to the idea that air is 'made up' of a number of different 'gases'. You might need to discuss 'another gas' they know - the gas in the burner. Again let them smell, feel and 'see' it. Tell the class that today they are going to make a gas - one that is in the air. Write the word oxygen on the board. Ask them if anyone has ever heard this word before - and what they can tell you about it. For example, a sick relative may have been given oxygen in hospital (Objective 1).

Activity

Let the pupils read section 5.1. Let one group demonstrate to the others what they are going to do and to show what is meant by a 'glowing' splint. Then let each group carry out the activity. Get each group to report on what they did and summarize this on the board using key words. Get each pupil to draw the diagram for Activity 5.1 and to write a report using the key words on the board. You and the technician should check their work as they do this.(Objective 2).

Let each group read section 5.2 and carry it out and then read section 5.3. Again let one group demonstrate to the class what they are going to do and let the class judge if they are correct or not.

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Each group should carry out the activity and spend five minutes or so discussing what happened. Then let them prepare a statement on what they think their result means. Allow the whole class to discuss their statements and guide them towards Objectives 3 and 4. Finally write these two objectives as statements on the board and get the pupils to write them into their books (Objectives 3 and 4).

Let the pupils read section 5.4. Demonstrate yourself what you want them to do and then let each group carry out the activity. Afterwards let the pupils look at their own charcoal and compare it with the lumps of charcoal that you have brought in.

Discussion and Evaluation

Ask if anyone can tell you how people make charcoal in Seychelles. Allow one or two pupils to explain and then summarize what they have said on the board - bring out the point that for to make charcoal we must limit the amount of oxygen in the 'fire' (Objectives 5 and 6)

Finally you should write a few sentances on the board and ask the pupils to fill in the missing spaces. For example,

"When we burn a candle in air it uses up some _____ and makes a gas called _____ _____"

You and the technician should check the work and help where necessary.

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Lesson

Unit 2 Topic 6

The Air that we Breathe

Time About four periods

Objectives At the end of the Topic the pupils should;

(1) know that air contains mainly nitrogen and oxygen and small amounts of carbon dioxide and water vapour,

(2) explain in their own words that when we breathe in air we use, or take out, some of the oxygen and when we breathe out we add some carbon dioxide and water vapour to the air.

(3) Using the apparatus listed in section 6.3, be able to demonstrate that breathed air contains more carbon dioxide than unbreathed air.

Equipment You will need

- a basin and a rubber tube so that each group can obtain a jar of 'breathed' air.

Each group will need

- two identical jars (one for 'normal' and one for breathed air)
- a candle (6.2)
- some lime water and a straw
- the respiration apparatus used in Activity 6.3 (see the diagram on page 18 of the pupils' work books)
- a dry test-tube (6.5)

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Introduction

From the previous Topic revise the idea that air is made up of a number of gases, one of which is oxygen and that when a candle or piece of wood burns in air it uses up some of the oxygen and makes some carbon dioxide.

Discuss the most important gases in the air and introduce the pupils to the words 'nitrogen' and 'water vapour'. (Don't worry about the properties of nitrogen at this stage) (Objective 1).

Set up the apparatus for Activity 6.1 and get one or two children to fill the jar with air. Show the pupils a jar of 'normal' air and a jar of breathed air from the apparatus and ask if they both contain the same air. Encourage the pupils to think of the jars as containing 'breathed and 'unbreathed' air. Then let them read and carry out Activity 6.2 (Get the pupils to 'hold in' the air in their lungs for as long as possible to make sure it is 'breathed' air that they fill the jar with in 6.1).

Let each group discuss and report on their results. Try to get everyone to realize that when we breathe air we use up some of the oxygen in it.

Show the pupils the apparatus for Activity 6.3. Let them read the section and then demonstrate to them what you want them to do (but don't use lime water in your demonstration). Let them carry out the activity and then allow them a few minutes to discuss their results. Let the class discuss what the results mean. Again guide the discussion so that the pupils realize that when we breathe out we add some carbon dioxide into the air (Objective 3).

Let the pupils breathe on the dry glass tube Ask them what they see. Ask what happens when they take a bottle out of the fridge. Allow the pupils some time to discuss this and guide them towards

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the idea that when we breathe out we add some water vapour into the air (Objective 2).

Discussion and Evaluation

Summarize the results of the three activities on the board so that the pupils realize that when we breathe we take some oxygen out of the air and add some carbon dioxide and water vapour into it.

On the board summarixe how 'we learned' that breathed air contains less oxygen and more carbon dioxide than unbreathed air.
Write the key words and get the pupils to write their reports in their own words using your key. Move around and check the pupils achievement of the objectives as they write up their work.

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Lesson

Unit 2 Project 1

Other Things in the Air

Time A single period -although you will need some time later to look at and discuss the results.

Objectives At the end of the Project the pupils should;

(1) know that there are microbes in the air which can be dangerous to our health,

(2) be able to explain in their own words that moulds on food are caused by microbe 'spores' in the air which settle and grow on the food,

(3) know that jam contains preservatives which help prevent moulds from growing in it.

Equipment You will need a piece of bread or fruit which has mould growing on it.

Each group of pupils will need three or four small dishes, e.g. Petri dishes, and a selection of food items including bread, banana and jam.

Suggested Lesson Format

Introduction Show the pupils the bread or fruit with mould on it. Ask them to explain what it is, what they think causes it and whether or not we should eat bread or fruit which has mould on it.

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Activity

If the sun is shining use curtains or posters to get a narrow beam of light - otherwise try shining a torch, a lamp or ray of light from a ray box into a dark corner of the room. Get the pupils to look for the specks of 'dust' in the air. Let them try to find layers or specks of dust which have settled on top of cupboards or in corners. Explain that some of these specks are actually tiny 'seeds' or 'spores' of the moulds we saw growing on the bread or fruit (Objectives 1 and 2).

Let the pupils read and then carry out Activity 2. Afterwards let each group compose a sentance or two about microbes in the air.

Discussion and Evaluation

Check each group's sentances and then let the individual pupils write their group's sentances into their books.

With more able pupils you might have time to tell them some stories about how we have learned about microbes in the air e.g. Fleming and penicillin or Pasteur and sterilization.

After about a week let the pupils look at and discuss what has happened. Make a table on the board to summarize the results of the different groups (Objective 3).

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Lesson

Unit 2 Topic 7

Looking at the Weather

Time You will need five or six periods to set up and teach this Topic but you should allow some time later for the pupils to continue taking their readings.

Objectives At the end of the Topic the pupils should;

(1) be able to use a thermometer to measure the temperature of the air in the laboratory to an accuracy of $\pm$ 1 degree C.

(2) be able to use a measuring cylinder and 'squash-bottle' rain gauge to measure weekly rainfall to the nearest ml.

(3) be able to construct and use a wind measurer - as described on page 21 of the pupil's book- to measure the strength of the wind to the nearest unit on a 0 to 5 scale,

(4) be able to pictorially describe the weather at a particular time as being either, (a) clear and sunny, (b) slightly cloudy, (c) cloudy and dry, or (d) cloudy and wet,

(5) be able to complete a weather chart similar to that on page 20 of the pupil's book,

(6) be aware of the importance of the weather in our everyday lives and be able to explain in their own words how the weather can affect; travel by sea, the supply of drinking water and the growth of plants.

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Equipment

You will need a 'wind measurer'(as on page 21)already made up to show to the pupils and a fan for demonstration

Each group of pupils will need

- a cardboard box about 30cm by 10 cm by 10 cm or a box which can be cut and pasted into a similar shape
- some card and stiff wire
- some glue or staples

(See the diagram on page 21 of the pupil's book) (7.3)

- a squash bottle with top quarter cut off (see diagram)
- a measuring cylinder (100 ml)
- use of a thermometer
- a sheet of A4 paper or card to make a chart.

Suggested Lesson Format

Introduction

Tell the pupils that you are going to ask them to describe the weather yesterday. They are not to talk to anyone but think for themselves and then write down a description of the weather

Allow as many pupils as possible to read out their descriptions. Emphasize the differences in the different descriptions. For example 'very hot', 'hot' 'warm', 'cloudy' or 'very cloudy'.

Activity

From the discussion guide the pupils to the idea (developed in Unit 1) that for accurate observations we should try to 'measure' the weather. Ask how we could measure how hot it is.

Revise how to use and read a thermometer and allow each pupil to read and record the temperature in one fixed area of the laboratory (Objective 1).

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Ask the pupils about the 'wind' yesterday. In the discussion bring out (a) the need for an instrument to measure the force or strength of the wind and (b) the fact that the wind may have a different force at different places, e.g. near the shore, on a hill, or inside and outside a building.

Show the pupils the wind measurer. Demonstrate how it works. Let the pupils read sections 7.3 and 7.4 and then describe to them how they are to make their own measurer. Check that they have understood by letting one pupil demonstrate to the rest of the class and then let each group make its own measurer. Afterwards let them test and compare the measurers using the fan. Allow some time for discussion by the pupils on how, when and where they should take their 'wind strength' measurements (Objective 3).

Allow the pupils a few minutes to discuss in groups how they can measure the amount of rain that falls in a week. From the discussion lead them to page 22 and the idea of using a rain gauge and measuring cylinder. Let the pupils make their gauges and then give them a test by placing a known volume of 'rain' into their gauge and asking them to measure it.

Again allow some time for the pupils to discuss how, when and where they will take the measurements (Objective 2).

Discussion and Evaluation

Finally discuss how they can judge or record whether it is 'sunny' or 'cloudy' on a particular day. In the objectives we have suggested four categories but based on your class discussion you may choose to use a greater number of categories of your own. Again allow the pupils some time to discuss how, when and where they will take their readings (Objective 4).

Let each group prepare its own chart and place it on

display in the laboratory or form room, (somewhere where the pupils can continue to fill them in. Allow plenty of time for the pupils to organize themselves for taking the readings and let each group report to you on how they plan to do it (Objective 5).

After the pupils have complete their charts for a week or more discuss and compare the results of the different groups. Use the results to lead into the discussion on how the weather affects our everyday lives (Objective 6).

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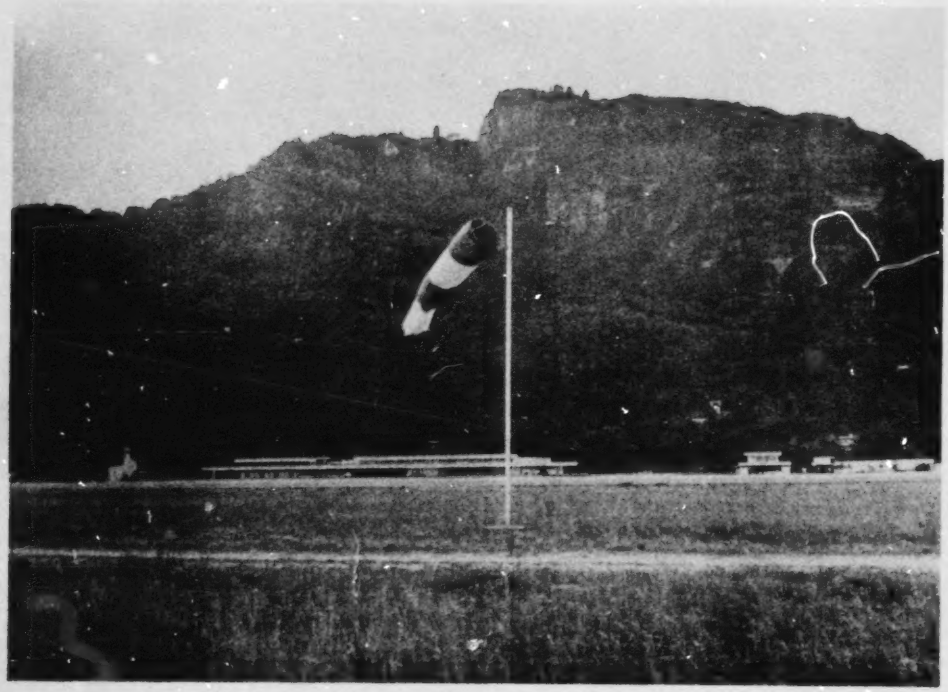
SEYCHELLES INTEGRATED SCIENCE

Unit 2



AIR AND WEATHER

SE045061
SE045061

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THE MINISTRY OF EDUCATION AND INFORMATION

R E P U B L I C O F S E Y C H E L L E S

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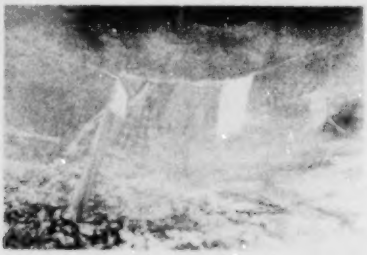
UNIT 2

TOPIC 1

AIR IS THERE

1.0 We often talk about the air around us. Can you see air ? Can you smell air ? Look at the picture - how many things show that air is really there ?

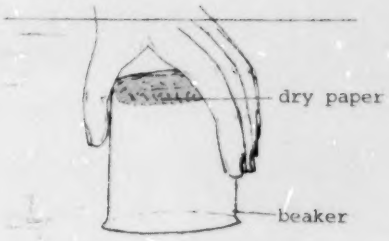


1.1 Now take a plastic bag. Fold it into four. Try to press it flat with your hand. Describe what you notice, and try to explain this.

Plastic bag

AIR IS THERE

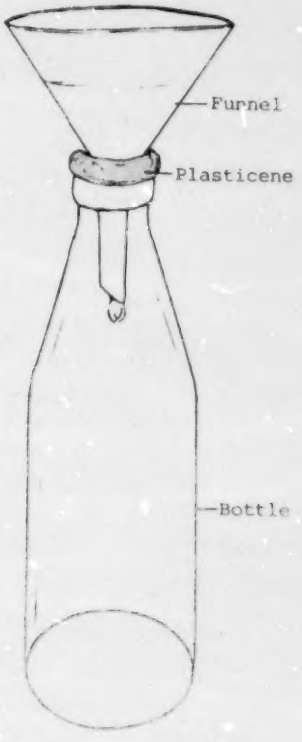
1.2 Push some dry paper into the bottom of a beaker. Hold the beaker with the open end downwards. Make sure that the paper does not fall out.



Push the beaker under water, then take it out, and look at the paper.

Is the paper dry or wet ? Explain this.

1.3 Put a funnel into the neck of a bottle. Put some plasticene around the base of the funnel. Now pour water into the funnel.



Describe what happens. Try to explain why this happens in your own words.

How could you make the water run into the bottle more easily ?

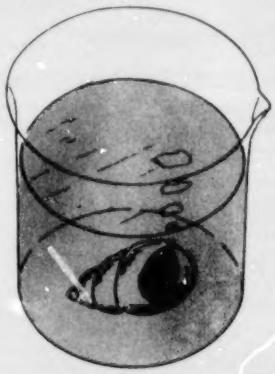
AIR IS THERE

1.4 We could "see" that the bag, the beaker and the bottle were full of air, because we trapped the air inside them. However, it is not always possible to "see" air inside things. So we must use other ways to show that air is there:

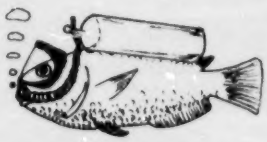
Put an empty sea shell or snail shell into water.

How do you know if the shell was full of air ?

Try to find out if there is air in some other things; for example - coconut husks, a sponge, soil, coral.....



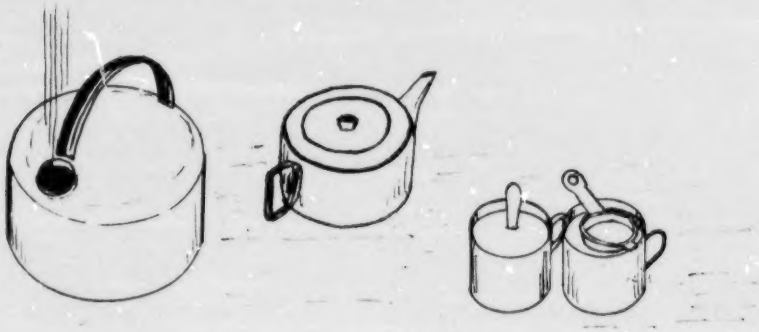
1.5 Look at a fish in the aquarium. Describe how it breathes. Where do you think it gets air to breathe from ?



1.6 We can do another experiment to find out if there is any air in the water that the fish breathes. Heat some fresh water slowly in a beaker. Describe what you can see on the sides of the beaker before the water boils.

Write down what you have found out about the way a fish breathes. Why do you think we must "bubble" air through the water in the aquarium ?

1.7 Some people say that you must always use freshly boiled water to make tea. They say that you should not use water that had been boiled before, because the tea will not taste as good as when you make it with freshly boiled water.



Suggest a reason <u>why</u> there could be a difference in the taste.

1.8 Design an experiment which you could do to show if someone really can tell the difference, if you make tea in these two different ways.

Discuss your experiment with your teacher before you do it.

Write a few lines about how you do your experiment, and the results that you get.

UNIT 2

TOPIC 2

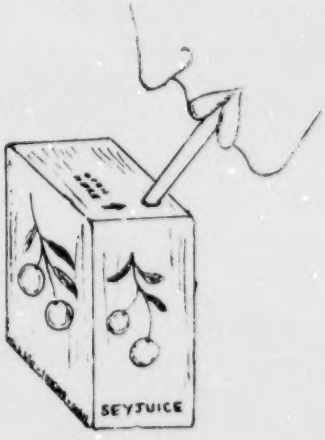
THE PRESSURE OF AIR

2.0 We have learnt from Topic 1 that many "empty" spaces inside and around things are not really empty, but "full" of air. Now we shall try to find out why air is able to fill these spaces.

2.1 Put an object, such as a book, a ball or a box into a clean plastic bag. With your mouth, suck as much air as you can out of the bag. Describe what happens to the bag as you suck air out.

Try to explain this.

2.2 Describe what happens if you suck fruit juice or milk from a carton without stopping.



Try to explain why this happens.

THE PRESSURE OF AIR

2.3 It is not easy for us to make an empty space with no air in it - a vacuum. However, we can use a vacuum pump to take some of the air out of a bell jar:

Describe what happens to the balloon as we take air out of the jar with the pump.

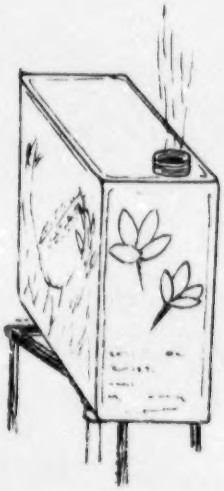
Try to explain this.

THE VACUUM PUMP

2.4 We can also remove air from a can as follows:

Pour some water into the can. Heat the water until it boils. Wait until the steam has driven all of the air out of the can - then, turn off the heat and put on the cap.

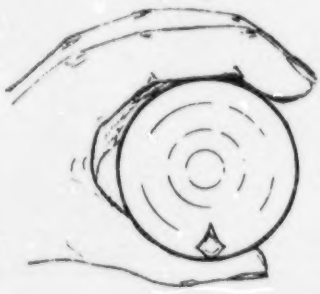
Describe and explain what happens as the can cools down, and the steam inside becomes water.



THE PRESSURE OF AIR

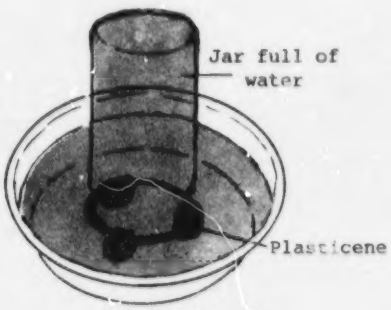
2.5 In experiments 2.1 to 2.4, when we tried to make a vacuum, the air outside tried to get into the vacuum. The air pressed so hard that it was even able to change the shape of a metal tin. We shall now find out more about the pressure of air:

Try to pour water from a can which has only one hole. What happens ?



Try to explain why this happens.

2.6 Fill a jar with water. Put three pieces of plasticene around the top of the jar. Put a basin over the top of the jar and hold it there. Turn the jar over quickly.



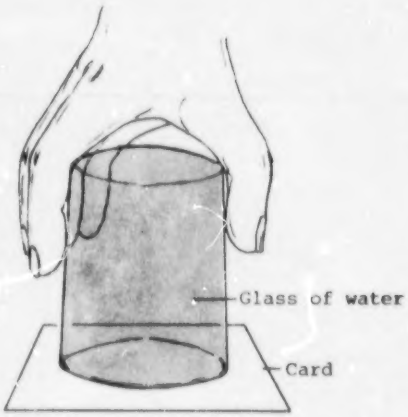
Does the water stay in the jar ? Suggest a reason for this.

2.7 You can use this idea to make a drinking fountain for chickens. Use a pippette or a straw to "drink" some water from the basin. Describe what happens when the level of the water in the basin falls below the jar. Try to explain this.

THE PRESSURE OF AIR

2.8 The picture shows someone holding a glass full of water upside down. A piece of card covers the end of the glass.

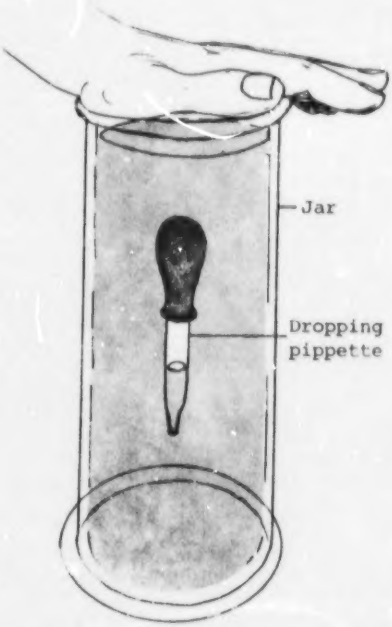
Using a glass and a piece of card, see if you can do this too. Write down in your own words how you did it, and explain why you think the water does not fall out of the glass.



2.9 We can make a "diver" using the pressure of air. Let some water slowly into a dropping pippette until it only just floats. Put it into a tall jar almost full of water. Put your hand over the top of the jar and press, so that your hand "compresses" the air inside.

Describe how you can make your diver move up and down.

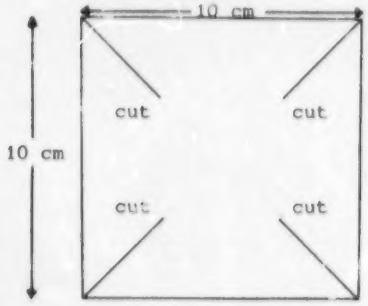
You may like to have a race, to see whose diver can dive most quickly.

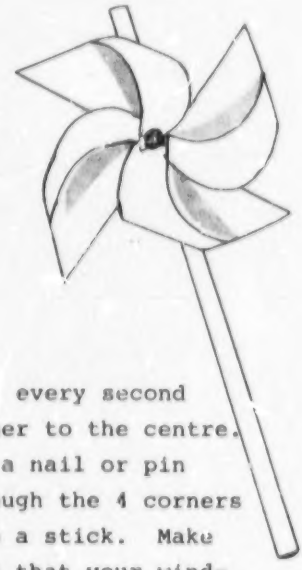


3.0 Now that we have learnt something about air, we shall find out more about how we can use air. First of all, write down some ways in which we use air that you can think of - at home; in our bodies; in a car; in a boat.....

3.1 We can use air to turn a windmill. You can make a windmill as follows:-

Cut a square piece of stiff paper - 10 cm long and 10 cm wide. Make four cuts, each 4 cm long, from each corner.





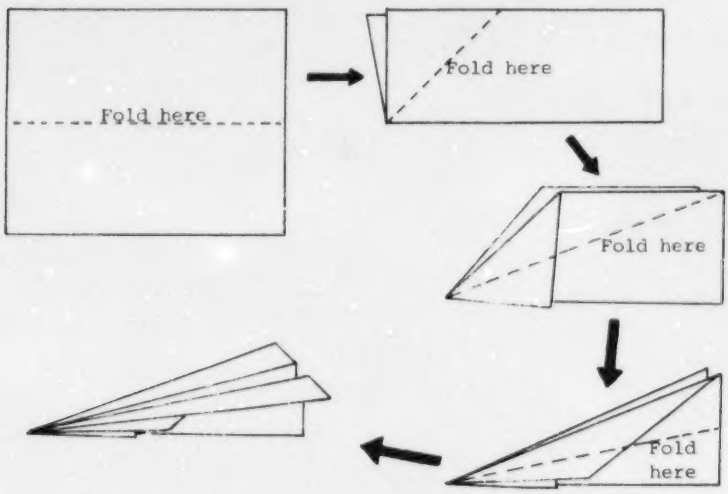
Fold every second corner to the centre. Put a nail or pin through the 4 corners into a stick. Make sure that your windmill can turn easily.

Find out how to hold or move your windmill to make it turn as fast as possible.

3.2 The people on the island of Poivre use a windmill to pump water for their houses and vegetable gardens. Do you think this is a good idea ? Why ?

USING THE AIR AROUND US

3.3 Aeroplanes can fly through the air because of the special shape of their wings which helps to lift them. The pictures below show you how to make one type of paper aeroplane:



Discuss how you think you could improve this design to make your aeroplane fly better - also say <u>how</u> you decide which is better.

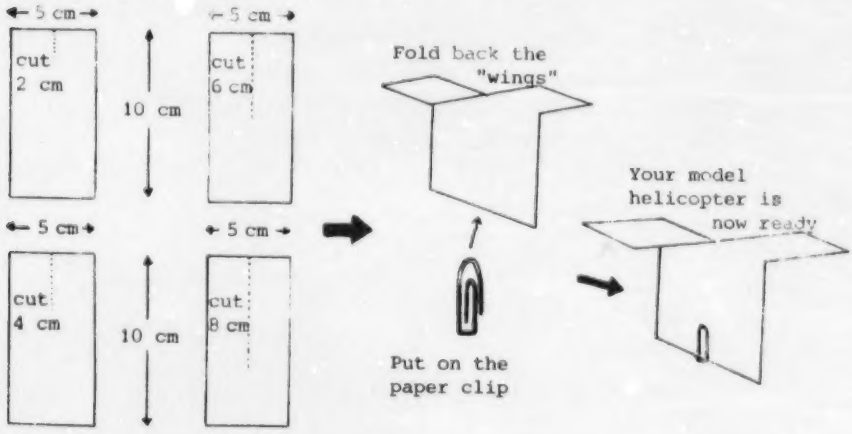
REMEMBER TO PICK UP YOUR AEROPLANES WHEN YOU FINISH AND DO NOT LEAVE LITTER.

3.4 Discuss with your group how life would be in Seychelles if there were no aeroplanes. Describe your ideas to the rest of the class.

3.5 We can also fly through the air using helicopters. Discuss any differences between aeroplanes and helicopters that you know about.

AEROPLANES	HELICOPTERS

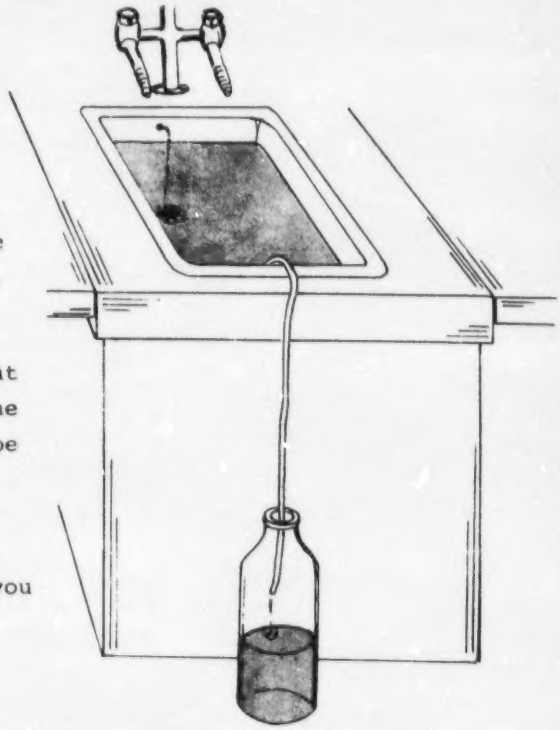
3.6 You can make some model helicopters with stiff paper. Cut 3 or 4 rectangles of paper as the diagrams sho below:



Attach a paper clip to each model at the bottom.

Plan an experiment which will help you to find out which is the best model helicopter. Describe what you do and record the results that you get. Also write down how you decide which is the best model.

3.7 Windmills, aeroplanes and helicopters all work by using the air to help them to move. We can also make use of the pressure of air in other ways, for example in a siphon:



You can use a siphon to move water from a high place down to a lower place. This picture shows how you could use a siphon to fill a bottle with water from the sink.

3.8 Now do an experiment to find out and describe what you need to do to make the water run through the tube into the bottle.

Find out and describe at least two ways in which you can make the water stop flowing.

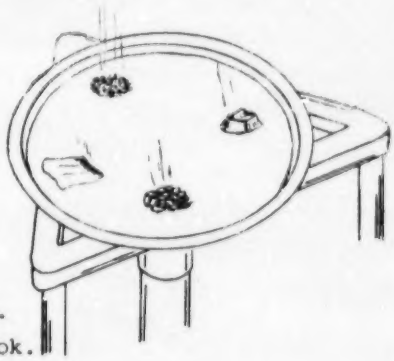
3.9 Write down as many occasions as you can think of when a siphon would be useful.

BURNING IN AIR

4.0 We have learnt something about how air fills spaces, the pressure of air and some ways of using these. We shall now try to find out what air is made of. To help us, we shall start by looking at the way things burn in air.

4.1 Make a list of things that burn easily. Compare your list with your friends'. Which things on your lists will catch fire most easily ?

You can find out how easily some things catch fire by heating them on a tin lid. You can try this with small pieces of paper, sawdust, sugar, coconut and so on...



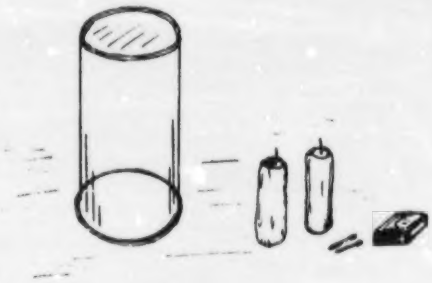
Describe what happens and what you do in this experiment. Record your results in your book.

4.2 Compare your results with your friends'. You may realise that things which burn more easily need less heat to start them burning. For example, how do you set fire to the gas from a gas burner ? Why do you think it is dangerous to smoke or to light a match at the petrol station ?

BURNING IN AIR

4.3 When you light a gas burner, you need to give it some heat from a match to make the gas start burning. The heat from the flame then keeps the gas burning. However, you can make it burn even hotter if you open the airhole. Try to suggest a reason for this.

4.4 Plan an experiment to show what happens if you stop air from reaching a flame. Use only a gas jar, two candles and some matches.



Discuss your plan with your teacher before you do the experiment.
Describe what you do and what you find out.

4.5 We have learnt that a flame needs air to keep burning. We can use this idea to help put out fires.

Make a small fire with a little kerosine and waste paper in a tin lid. Try to find different ways to put out the fire - for example with sand, with a cloth, with water and so on.....

Explain in your own words how these can stop the fire burning.

SOME GASES IN THE AIR

5.0 We have learnt that something can burn properly only if it gets enough air. Now we shall try to find out more about the special gas in the air that helps burning - the gas we call <u>oxygen</u>.

5.1 You can make some oxygen gas in a test-tube:

- heat some potassium permanganate gently. Put a glowing splint of wood into the tube. What happens ?

Blow air onto a glowing splint.
Compare this with what happens in oxygen.
Write down what you have found out about oxygen gas and air.

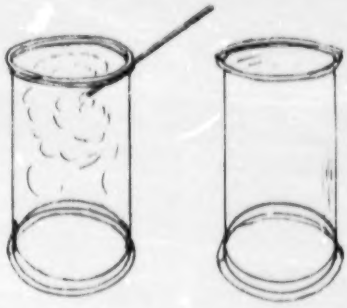
5.2 Watch a burning splint carefully and describe what happens to the wood as it burns. Now blow out the flame and let the splint cool.

Give a name to the black powder on the end of the splint. Try to write this name with the splint on a piece of paper.

SOME GASES IN THE AIR

5.3 As the splint burned in air it changed into black carbon. This black carbon also burned and then "disappeared" into the air. Now we shall try to find out what has happened to the carbon, using a special chemical, lime water, which we make from chalk.

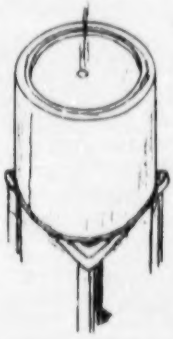
Put some lime water into 2 gas jars. Lower a burning splint into one jar and cover it. Cover the other jar at the same time. Take out the splint when it has stopped burning. Shake both jars.



Describe any change that you notice in the lime water. Try to suggest what could cause this change.

5.4 If we let carbon burn completely with oxygen from the air, we get carbon dioxide gas, which makes lime water become milky. So if we let wood burn completely with plenty of air, much of it will change into carbon dioxide gas.

Now let us find out what happens if we try to burn wood without much air. Put some matchsticks into a tin. Make a hole in the lid of the tin. Heat the tin strongly for several minutes.



Look inside when it is cool and describe what you have made. Describe and explain how people usually make pieces of carbon (charcoal) in Seychelles.

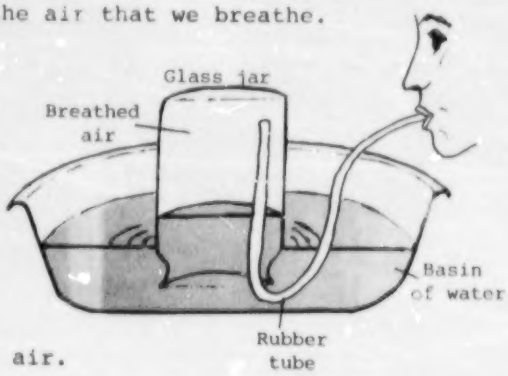
UNIT 2

TOPIC 6

THE AIR THAT WE BREATHE

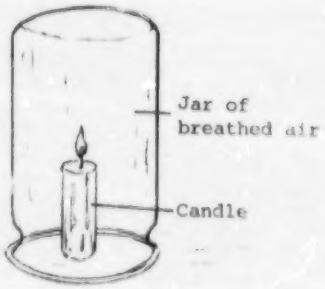
6.0 The air around us contains more than just oxygen and carbon dioxide. Most of the air is another gas called nitrogen, and there is often much water vapour in the air. Now we shall find out more about what happens to these gases in the air that we breathe.

6.1 You can fill up a glass jar with "breathed air" using a rubber tube and a basin of water. First fill the jar with water. Then breathe air into and out of the jar many times. Cover the jar when it is full of breathed air.



6.2 Find out how many seconds it takes before a candle stops burning in a jar of breathed air.
Repeat this with the same candle in a jar of normal air.

Record and compare the two results.



Which jar do you think has more oxygen in it ?

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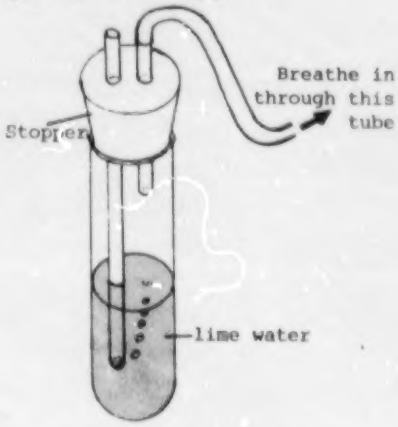
What do you think happens to the oxygen in the air that we breathe ?

THE AIR THAT WE BREATHE

6.3 When you breathe in, you take some of the oxygen from the air into your body. We shall find out what comes from your body to replace this oxygen.

Breathe out gently through a straw into some lime water. Write down what happens.

Now breathe in through the tube in the apparatus (right) - when you breathe in you should see bubbles coming from the other tube.



6.4 Compare the results of the two experiments that you did in 6.3. What can you learn from these about the amounts of carbon dioxide in the air that you breathe in and out ?

6.5 Put a dry glass test-tube close to your mouth. Breathe on the outside of it several times. Describe what you see on the tube.

Explain where you think it has come from.

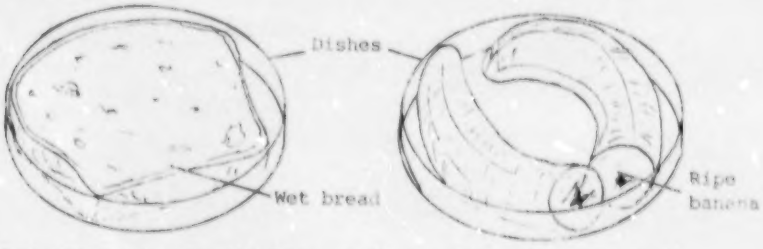
UNIT 2

PROJECT 1

OTHER THINGS IN THE AIR

1. There are many other things in the air besides gases. For example, what do you find if you run your finger along the bar of your chair, or inside a desk or a cupboard ? Where do you think this "dust" comes from ?

2. Some people talk about "microbes" floating around in the air. You can try to catch these microbes by leaving some food out in the air on which they can grow:



Put some pieces of food such as ripe fruits, wet bread, jam and so on into dishes.

Leave them for a few hours and then cover them with glass jars or beakers. Look at them closely for a few days.

3. Describe what you can see growing on the food. Explain where you think these "moulds" have come from.

NOTE YOU MUST NOT TAKE OFF THE COVERS WHEN YOU LOOK INSIDE THE JARS !

Can you think of a reason for this ?

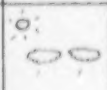
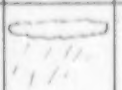
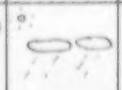
UNIT 2

TOPIC 7

LOOKING AT THE WEATHER

7.0 We can learn a lot about the weather from the air around us. We can measure the temperature of the air to find out how hot it is. We can measure the movement of the air to find out how strongly the wind blows. The pressure of the air helps us to forecast what the weather will be like later.

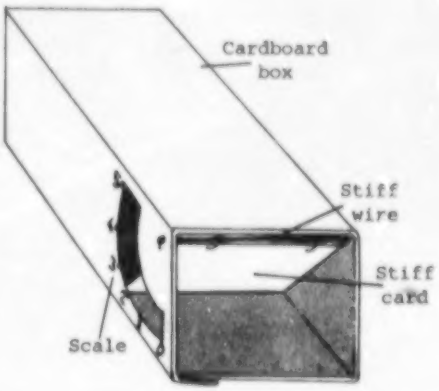
7.1 First you will need to make a weather chart for the week. You should complete the chart every day to show what the weather was like the day before. First, you could draw a picture to show how sunny or cloudy the weather was. Then you could make measurements of the wind, the temperature and the rainfall:

DAY DATE	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
SUN / CLOUDS							
TEMPERATURE	31 °C	30 °C	29 °C	30 °C	°C	°C	°C
WIND STRENGTH	2	1	1	3			
RAINFALL (TOTAL THIS) (WEEK =_____)	0 ml	5 ml	16 ml	8 ml	ml	ml	ml

Make more charts for the weeks that follow. Take it in turns to record the weather every week.

7.2 Measure the temperature of the air every day using a thermometer in the shade. Record your results on your weather chart. Why do you think we measure temperature in the shade and not in the sun ?

7.3 You can also try to measure the strength of the wind. Make a box like the one in the picture from pieces of cardboard cartons and staples or glue.



Cut a slit in one side of the box as shown. Make two holes near the top of the box close to the end where the slit is. Put a stiff wire across the space between the holes.

Cut a rectangle from stiff card. Hang the card from the stiff wire at the end of the box using wire loops.

7.4 Blow on the card. You should be able to see the card moving if you look through the slit. Write numbers from 0 around to 5 next to the slit. When you want to measure the strength of the wind, point the box into the wind. Record the highest point that the card reaches.

Write your results in your weather chart every day. Suggest how you could improve your "wind measurer"

LOOKING AT THE WEATHER

7.6 To complete your weather measurements, you will need to measure the rainfall. You will use a rain gauge to do this.

Cut the top part off a plastic squash bottle. Turn this part over and fit it into the lower part of the bottle. This makes a funnel for the rain water.

You should stand the bottle outside, away from the cover of trees and buildings.

Why do you think this is important ?

(You may need rocks or blocks to stop the bottle from falling over.)

7.7 Pour the rain water from your rain gauge into a measuring cylinder at the same time every day. Record the volume of water in the bottle on your weather chart.

Take turns to record the rainfall every week.

7.8 Keep all of your charts in a safe place so that later you can find which months in the year have the most rain, the most sun, the highest temperatures and the strongest winds. If you are planting crops, or going fishing, you will find your charts very useful. Suggest reasons why this is so.

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